Advanced applications of the ESA Concurrent Design Facility (CDF)

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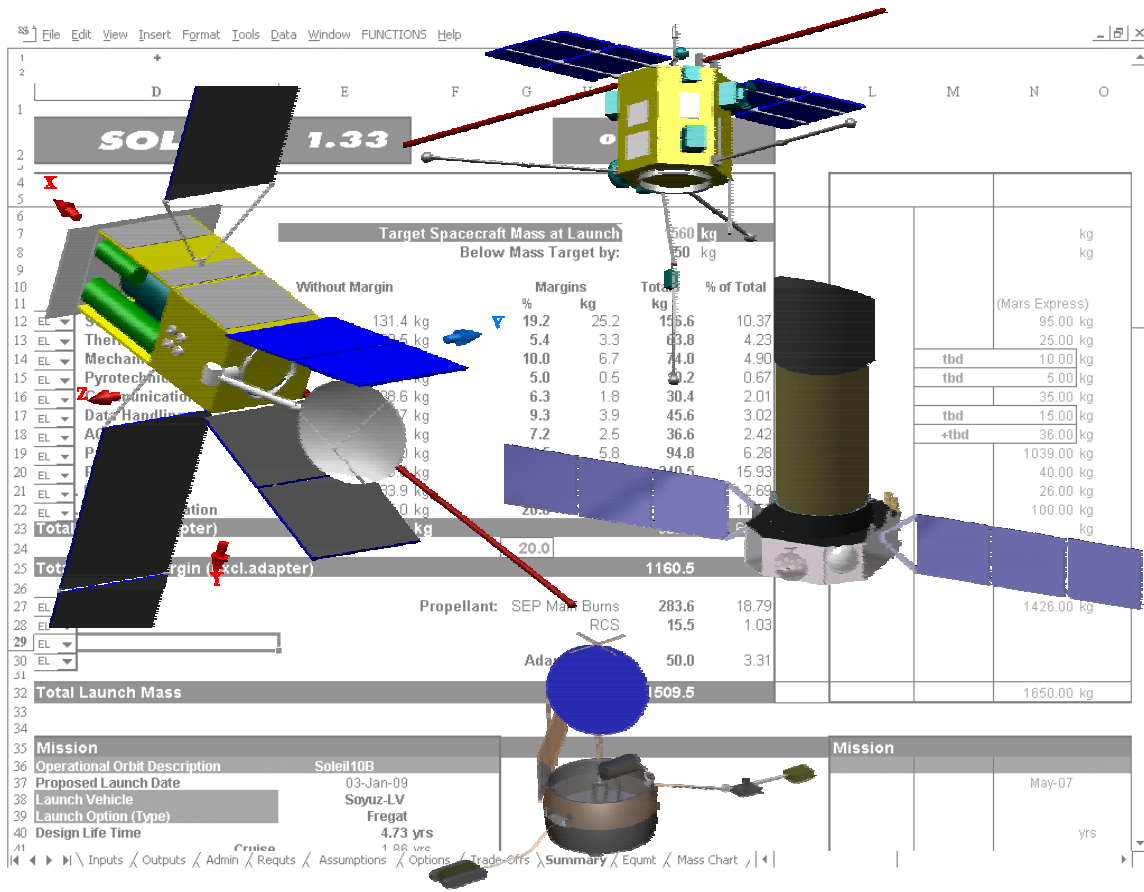
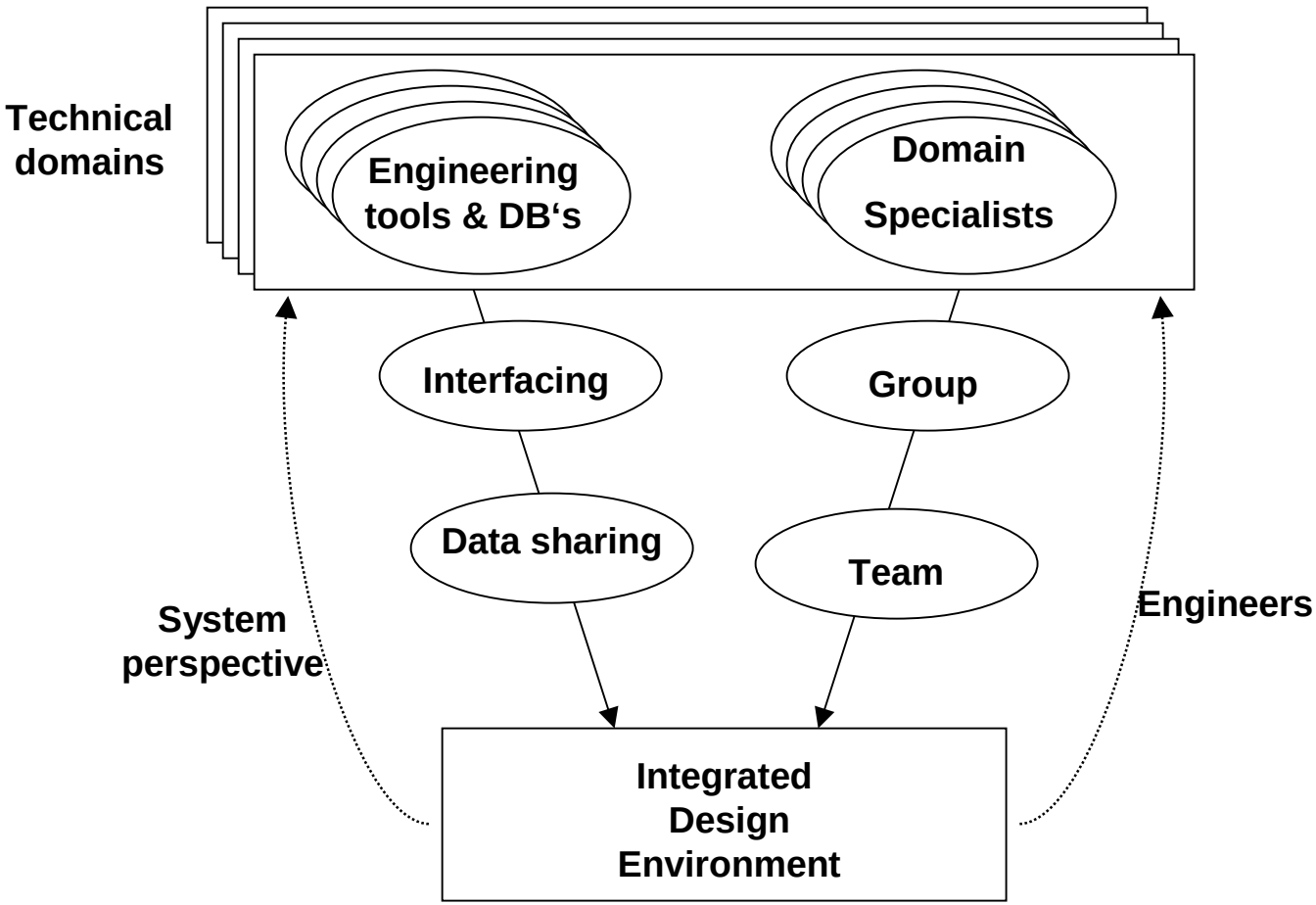


CDF: the objectives

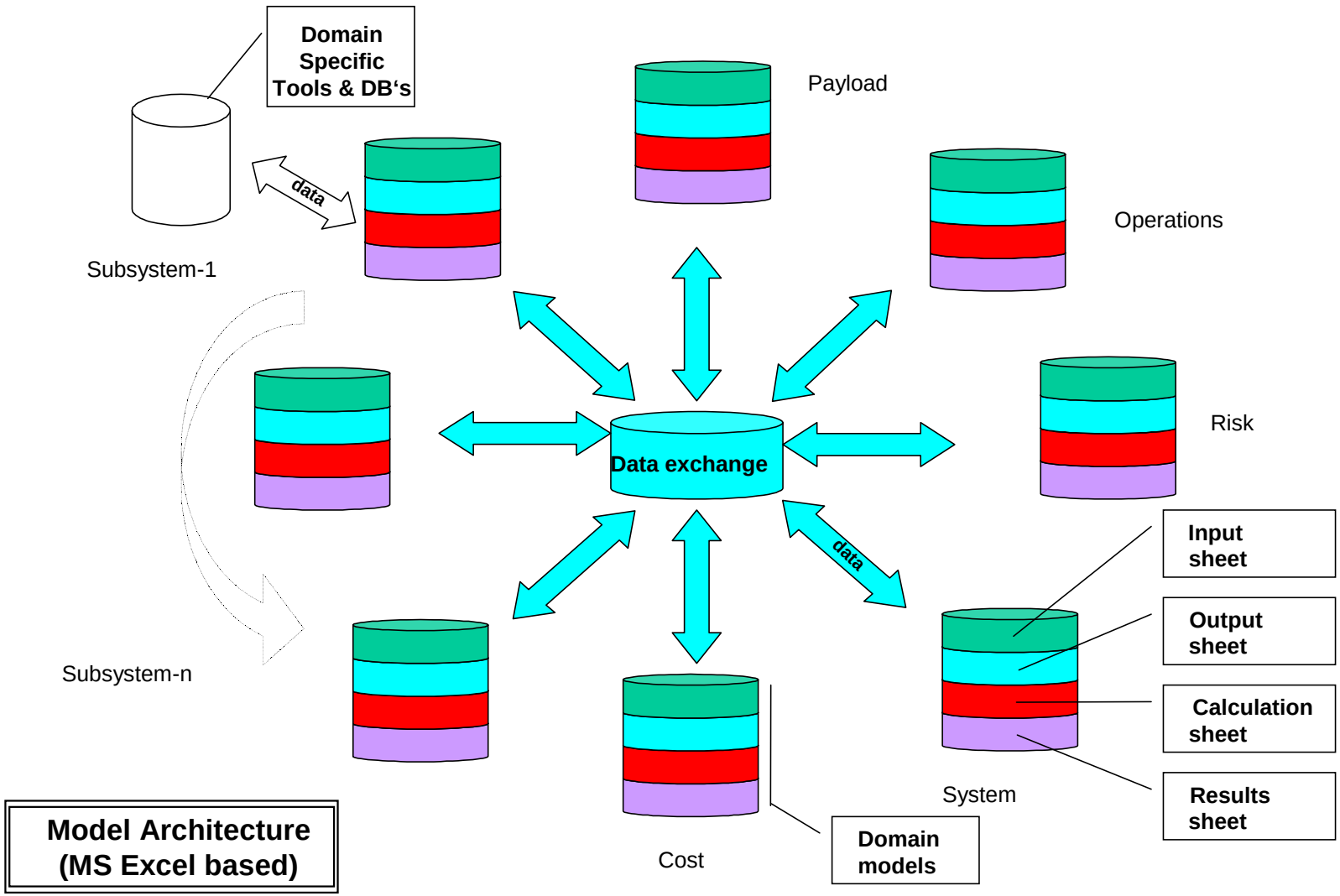
- **The Concurrent Design Facility was established at ESTEC in Nov. 1998, on experimental basis, with the scope to provide:**
  - **a mission design environment for the conceptual design of new space missions (currently applied to internal pre-phase A / level 0 assessment studies)**
  - **a set up for the application of concurrent engineering principles**
  - **a more effective organisation of existing mission analysis and design tools and human resources**
  - **a generic approach to capture corporate knowledge for further reuse**

CDF: approach

- **Re-organization of existing tools and human resources in a more effective (i.e. “concurrent”) way**



CDF: integrated design model

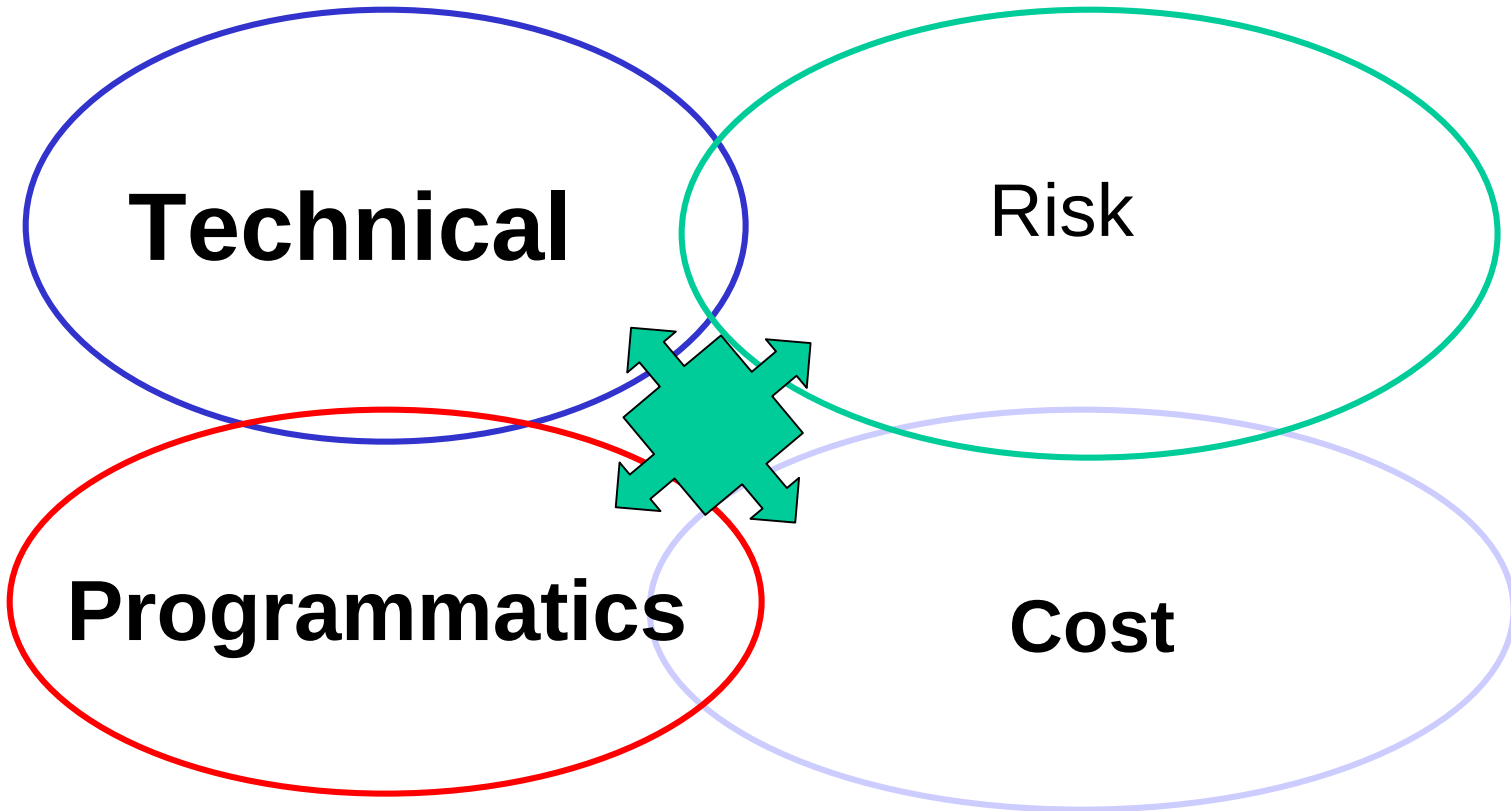


The ESTEC CDF: layout

CDF: studies performed (Jan.'99 to date)

- CESAR99
- Solar Orbiter
- Meteo Imager Sounder Satellite - MISS
- World Space Observatory - WSO/UV
- Mercury Surface Element - MeSE
- Eddington
- MASTER
- STORMS
- Hyper
- Ocean Earth Watch

Space Mission Feasibility



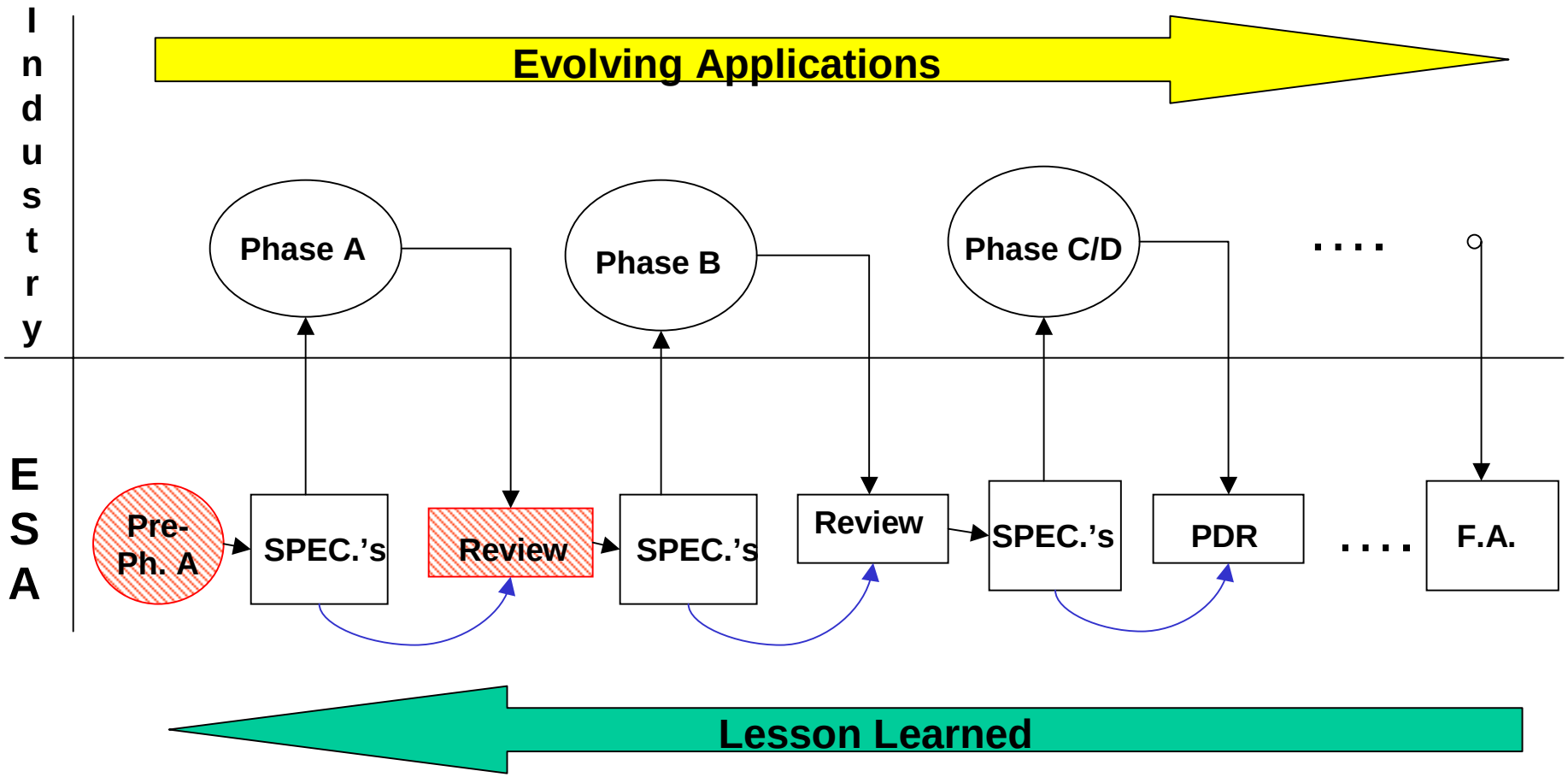
CDF: the present...

- **The ESTEC CDF has become a functioning, operational and accepted component of the ESA in-house mission design assessment process**

… and the future

- **Other possible applications of the method and facility in the ESA context:**
  - **support reviews,**
  - **system requirements definition,**
  - **proposal evaluation,**
  - **instrument conceptual design,**
  - **training,**
  - **...**

The ESA context



Phase A Industrial Study reviews

- **LISA: Laser Interferometer Space Antenna**
- **STEP: Satellite for the Test of the Equivalence Principle**
- **decision to run these reviews in CDF was taken "a- posteriori" (1)**
- **review in 2 steps:**
  - **internal review - model based (2)**
  - **involvement of industrial team (either locally or remotely)**

(1) Model input interface specification will facilitate the review activity (foreseen for BepiColombo)

(2) allowed: a) the implicit verification of the model consistency,
b) the verification of alternative design options

Support Industrial Phase A for ISS facilities

- Dusty Plasma (ICAPS):

- **Collaborative management and interactive support**
- **Joint sessions for Scientific Requirements Definition**

Achievements:

- **improved communication and understanding between scientific and engineering teams**
- **simultaneous definition and agreement by all parties**

- support to other ISS facilities (Phase A/B) being planned

ESTEC CDF / JPL Team X STEP joint design results

- STEP a multi-national project where the payload is provided by NASA (Stanford) and the SVM by ESA

3 joint sessions...

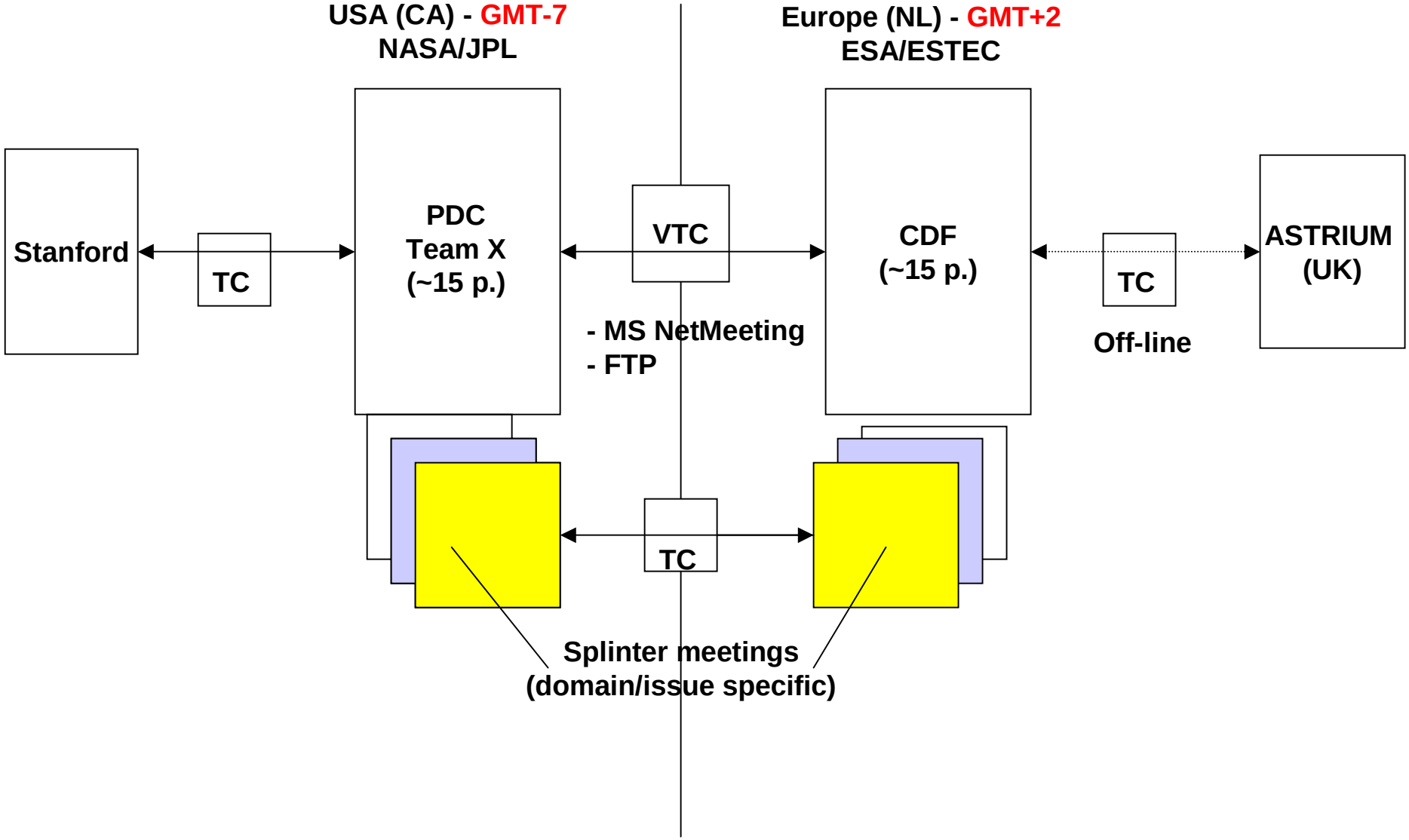
… analysed:

- **Design baseline**
- **Critical issues**
- **Interfaces**

… produced (mutually agreed):

- **Conceptual design iterations and finalisation**
- **Interface Control Document**
- **System requirements**

ESTEC CDF / JPL Team X STEP joint design sessions



CDF: other applications

Phase B, C/D

- **Project review of more advanced phases**
- **Structuring and better organisation of the reviews**
- **Ideally: standardised documentation**
- **above all: standardised project data**

- **ref. Virtual Satellite paper by J.Miro' (ESA/ESTEC)**

CDF: other applications

Model the “Unconventional”

- **R&D activity**
- **Verification of new technologies at mission/system level**
- **System evaluation of advantages/disadvantages of certain technology programmes**
- **Verify and support development decisions**

CDF: other applications

CDF for Education:

- **recent requests and initiatives by some university aerospace departments to use the CDF (or CDF-type environment) as an educational tool**
- **first experience (experimental phase)**

⇒ **Education is an important objective but is not the primary reason to have built the facility**

⇒ **might give the opportunity to check the <u>portability</u> of the facility**

Distributed Concurrent Development

- **need for a more performant infrastructure, quality step-up:**

- **what's beyond Excel?**
- **which role is GRID going to play?**